

PURDUE STUDENTS SURVEYING IN THE KNOB REGION ON STATE FOREST RESERVATION,

BOARD OF FORESTRY

INDIANA

ARBOR AND BIRD DAY ANNUAL

FOR THE

SCHOOLS OF INDIANA

ISSUED BY

FASSETT A. COTTON


State Superintendent of Public Instruction



INDIANAPOLIS :

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TO TEACHERS AND PUPILS OF PUBLIC SCHOOLS OF INDIANA.

It has been the custom for a number of years to observe Arbor and Bird Day in the schools of Indiana, and the results of this work have been very gratifying to all lovers of nature. It is important to inculcate in the minds of the children a sincere love for nature and a desire to cultivate and protect useful and beautiful trees and birds. Nothing speaks more for the culture of a home or a school than well kept lawns with beautiful plants, trees and vines which present inviting places for the native birds. The Governor's Proclamation sets forth clearly the importance of observing such days and it would be well to have this proclamation read to every school in the State.

The object in the preparation of this program has been to add to the work of previous years and to place the material before the children in a still more attractive way. This, it is believed, is the best way to promote interest in our trees and birds. The Secretary of our State Board of Forestry, Mr. Freeman, has certainly succeeded in making this program an attractive one. To the careful and excellent description of a number of trees in last year's program he has added four others. The birds selected are all more or less familiar. This selection is made in order that those closely allied, but less known, may become as familiar.

Trusting that a wider acquaintance may be made with the trees and the birds, and that Arbor Day, this year, will mean more than ever before,

I am sincerely,

F. A. COTTON.

PROCLAMATION BY THE GOVERNOR.



GOVERNOR DURBIN.

There has been within recent years a widespread awakening of interest in reforestation, especially in Indiana, a State favored lavishly by nature with timber resources that to the pioneer seemed limitless and inexhaustible. The rapid development of the agricultural and industrial interests of the State has been accompanied by a sacrifice of our forests, until the people of Indiana have been brought to a realization of the importance of systematic effort with a view to preventing further devastation. There

has arisen a patriotic interest in the planting and preservation of trees, which will not only furnish the raw material necessary to the maintenance of many of Indiana's most important domestic industries, but perform an invaluable aesthetic function in adding variety and charm to the landscape.

Appropriately, therefore, the State has taken cognizance of the economic necessity of forest restoration and preservation. Forestry laws adapted to the peculiar conditions existing in this State have been enacted. Apparent progress has been made in arousing the people of Indiana to the vast importance, especially to future generations, of that systematic and persistent effort necessary to the ample realization of the possibilities of the soil and climate of our State in the development of timber resources.

In further recognition of the State's interest in this important movement, I, Winfield T. Durbin, Governor of the State of Indiana, do hereby designate and proclaim Friday, April 24, and

Friday, October 23, 1903, to be observed as Arbor Days throughout the State, by the planting of trees for the beautification of public and private grounds and highways. And it is hereby recommended that those having charge of public and private schools shall provide for the further celebration of the second date hereby set apart by exercises appropriate thereto.

Done at the Capitol of Indiana, in the City of Indianapolis, this tenth day of April, in the year of our Lord, nineteen hundred and three.

WINFIELD T. DURBIN,

Governor of Indiana.

By the Governor:

DANIEL E. STORMS,

(Seal) Secretary of State.



GRAND VIEW ROAD LEADING THROUGH THE FOREST RESERVATION TO CUSTODIAN'S HEADQUARTERS.

HISTORY AND ORIGIN OF ARBOR DAY.

The first to call attention in this country in an impressive manner to the value and need of trees, because of their beauty and adaptation for ornamental purposes, and their value to all classes of people in the general welfare, was Mr. George P. Marsh, who, for many years, represented us at the courts of Italy and Turkey. It was during his residence at these places that he saw the needs, and the subject was impressed on his mind.

In Europe Mr. Marsh found the governments making active endeavors at great expense to renew their forests, which had been greatly depleted. He found the forests to be the most cherished possessions, and regarded as the most valuable product of the soil. He also found schools and colleges established for the training of men for the successful cultivation of forests, and saw the growing of trees in forest masses reduced to a science and established as one of the prominent departments of the government.

His observations led Mr. Marsh to write his publication entitled "The Earth and Man," containing the excellent chapter, "The Woods," to which we are indebted for the awakening of the people to the importance and necessity of heroic efforts toward forest conservation.

It was about this time that a practical movement was inaugurated by the late Hon. J. Sterling Morton, then Secretary of Agriculture, for tree planting in Nebraska. It was the thought of this pioneer of the plains, who knew and felt the value of trees about the home, to enlist his fellow-people throughout the State in the work of tree planting on one and the same day. This movement resulted in the establishment of Arbor Day for the State of Nebraska, and in the issuance of a proclamation by the Governor of that Commonwealth recommending its observance by tree planting throughout the State.

At an annual meeting of the State Board of Agriculture at Lincoln, Neb., January 4, 1872, the Hon. J. Sterling Morton introduced the following resolution, which was unanimously adopted:

Resolved, That Wednesday, the 10th day of April, 1872, be and the same is hereby especially set apart and consecrated for tree planting in the State of Nebraska, and the State Board of Agriculture hereby name it Arbor Day, and urge upon the people of the State the vital importance of tree planting, and hereby offer a special premium of \$100 to the agricultural society of that county in Nebraska which shall upon that day plant properly the largest number of trees; and a farm library of \$25 worth of books to that person who, on that day, shall plant properly, in Nebraska, the greatest number of trees.

Over a million of trees were planted in Nebraska on the first Arbor Day, April 10, 1872.

In 1875 the Governor of Nebraska, by public proclamation, set apart the third Wednesday of April as a day to be observed in the planting of trees. Annually thereafter other Governors made such proclamation until the winter of 1885, when the Legislature passed the act which designates the 22d of April, birthday of Mr. Morton, of each year as Arbor Day, and making it one of the legal holidays of the State.

Then in 1895 the name and the fame of Nebraska was further recognized and fixed by the following joint resolution which was approved by the Governor, April 4, 1895:

Whereas, The State of Nebraska has heretofore, in a popular sense, been designated by names not in harmony with its history, industry, or ambition; and

Whereas, The State is pre-eminently a tree-planting State; and

Whereas, Numerous and honorable State organizations have, by resolution, designated Nebraska as the "Tree Planter's State;" therefore, be it

Resolved, By the Legislature of the State of Nebraska, that Nebraska shall hereafter, in a popular sense, be known and referred to as the "Tree Planter's State."

At the same session, and as an outgrowth of the same sentiment, the following joint resolution was also adopted:

Whereas, The adoption of a State floral emblem, by the authority of the legislature, would foster a feeling of pride in our State and stimulate an interest in the history and traditions of the commonwealth; therefore be it

Resolved, That, the Senate concurring, we, the Legislature of Nebraska, hereby declare the flower commonly known as the "Golden Rod" (*Solidago serotina*) to be the floral emblem of the State.

Approved April 4, A. D. 1895.

It is estimated that, because of Mr. Morton's efforts, more than 800,000,000 trees are beautifying the State of Nebraska alone.

Minnesota first observed Arbor Day in 1876, in which year 1,500,000 trees were planted. The States of Michigan, Iowa, Kansas, Ohio and Indiana followed in succession. Michigan passed an Arbor Day law in 1881 and Ohio in 1882. In most all the States Arbor Day is recognized and encouraged by the civil authorities.

Arbor Day was first inaugurated in Indiana in 1884, but the day was not given general recognition until October 30, 1896. Since that time it has been observed annually on the last Friday in October by direction of the civil authorities.



LANDSCAPE VIEW OF STATE FOREST RESERVATION, CLARK COUNTY, INDIANA, SHOWING CUSTODIAN'S HEADQUARTERS ON
GRAND VIEW KNOB IN THE DISTANCE.

TO THE TEACHERS AND SCHOOL OFFICERS OF INDIANA.

Greeting—I take pleasure in preparing for your consideration suggestive work concerning tree planting and forestry for the observance of Arbor Day, and trust that it may assist you in stimulating a greater interest in tree planting, tree culture and general forestry work throughout the State.

Arbor Day and forestry are growing constantly greater in interest and value throughout the rural communities, and they are recognized as matters of much importance for promotion. The planting and the cultivation of trees along the roadsides, on the public grounds and at the homes are appropriate means of commemorating the lives of the famous men and women of the Nation and State. It is a most fitting plan to teach the virtues: patriotism, love, kindly sentiment, thankfulness, self-sacrifice and charitableness. The devoted observance of Arbor Day as well as all other memorable events is a good means to stimulate the right destiny of the Nation, because the home and the school are the embryo units of the Nation and the source of all that it becomes. Tree planting is one of the best expressions of an altruistic spirit.

The criminal waste and destruction of the forests of the State, both in its past and present history, should call for legislation that will compel their preservation. Every influence should be used to promote a goodly sentiment in behalf of saving the fragments of forests remaining and the cultivation of permanent forest areas, and it is to this end that I appeal for the sympathetic co-operation of the teachers and officers of the schools.

W. H. FREEMAN,
Secretary State Board of Forestry.

ARBOR DAY TREE PLANTING.

Tree planting on Arbor Day by the schools is, usually, accompanied by literary exercises consisting of essays, songs, recitations and addresses. In most cases the literary program forms the absorbing feature of a day intended for another purpose. I am not attempting to discourage the literary exercises in connection with the tree planting program, as it is a means of stimulating interest and bringing together the community and causing a revival of interest in both school and trees, but I suggest that much more attention be given to the matter of the arboriculture feature. The selection, the method of planting, the time when to do it and the care devoted to the trees after the Arbor Day program has been rendered are the vital elements which bring results from the exercises, and if these matters are not given emphasis the day's program falls far short of the purpose.

The selection of the trees for Arbor Day planting should be attended to with care, and only such ones chosen and planted as are hardy to the conditions at hand. The school ground should not be made a place of experiment, and, naturally, trees on public grounds are exposed to injury more than on private grounds. Any trees which can not endure moderate abuse should not be chosen, as under the best of restrictions the soil will be trampled, twigs broken and other numerous common injuries imposed. The soil of the school or other grounds intended for planting should be studied, because differences in soil make necessary differences of tree selection and all the attendant features of propagation. Because a tree is known to grow in the locality does not imply that it will grow on any spot in the community. Sandy soils and clay soils are found in alternate relation in almost any part of the State, in both strata and territorial connections, and a tree which thrives in one soil may have a struggle to exist in the other. When a study of the soils has been made to determine the differences in kind and porousness and then adaptable trees selected, rightly planted and properly cared for, after success is almost assured.

There are also other questions which should be considered before the selection of trees is made and they are the permanent devotion of the ground to the purpose for which tree planting is done, the immediate needs and the space allotted to a tree. If the grounds under consideration are to be devoted permanently, so far as can be foretold, to the use for which it is set apart and the present needs of tree decoration are not urgent, then the long-lived trees should be chosen and such as will correspond with the other conditions of soil and moisture. If the area is not likely to be permanently devoted to the present uses and the decoration is to fill a limited time and necessary want, then the short-lived, fast growing trees should be selected. In cases where the conditions are permanent and the needs immediate a compromise can be made by planting the different lived trees in alternate harmony. They may be planted closely and at a proper development in growth the short-lived trees can be cut out and the permanent trees left at proper distances.

In places where the space will not permit large spreading topped trees the selection should be of trees the tops of which are more dense and compact. The following lists will give information concerning selections. The long-lived trees best suited for decorative plantings on permanent open grounds are the American elm, American ash, sugar maple, Norway maple, Tulip poplar, linden or basswood, American chestnut, sweet gum, sycamore, scarlet oak, red oak, white oak, yellow locust and some of the evergreens. Those best suited for limited time are red maple, ginkgo, pin oak, horse chestnut, hackberry, catalpa, Lombardy poplar, some of the evergreens and a few foreign varieties. Where the space is limited but permanent the trees best suited and which adapt themselves to the conditions are the sugar maple, Norway maple, linden, chestnut, sweet gum, American ash, scarlet and red oak and tulip poplar. The trees which should not be planted any place for decoration are the Carolina poplar, silver maple and other similar kinds.

The time and method of planting should be given the closest attention. The time is subject to difference of opinion, but such is mostly due to the object in mind. If an agent or individual cares only to dispose of his trees he may argue that any time is good for

planting, but a scrupulously honest individual will not disregard the proper time to plant. In Indiana fall planting may sometimes be done to advantage, but it can not be held as a rule to practice. In all ordinary conditions early spring planting is more successful, especially for deciduous trees. The best time is immediately after the freezing is over and the soil is dry enough. The reasons given against fall planting are that the trees do not get a sufficiently established root system to sustain them against the hard freezings and thawings of the winter. If it is possible the planting should be done on a cloudy, cool day, and unless the atmosphere is very moist the trees should be kept moist by having their roots submerged in water or a thin mixture of earth and water and only removed as they are planted. A very few minutes exposure to the air will injure the small fibrous roots which are the feeders of the tree.

The holes for the tree should be dug a few days before the time of planting. They must be large enough so that the roots can be placed in their natural positions without the least cramping. It is well to have a foot or more additional space on all sides of such ample depth that plenty of loose soil can be placed under the roots. In digging the holes place the top soil by itself and if the lower soil is poor and lumpy it should be substituted by richer finely pulverized earth for the planting. Use no manure unless it is thoroughly mixed with earth, and such should not be placed around the roots, as manure will burn and rot them. Good, clear, rich, heavy, finely pulverized soil is at all times better for tree planting. By digging the holes a few days beforehand the soil requisites can be arranged and the proper moisture conditions secured. If the earth is too wet it will afford time for proper drying out, and if too dry it will afford time to fill the holes with water and saturate till the result is satisfactory for good planting. A good drainage is essential, as but few trees will live in a place where water settles around the roots and is retained by a heavy clay.

The trees should be set at a depth of an inch deeper than it originally grew, and should be set firmly and fastened by strings tied to stakes to prevent the winds from swaying and loosening it in the ground. Be careful in doing this not to injure the bark. After planting, the ground should be mulched around with rotten

substance either of straw, tanbark or sawdust. This device will not only retain the moisture but will keep down the weeds and fertilize the soil. With this treatment watering will not be necessary except in excessive drought, in which case several gallons of water should be poured around the roots of the tree every few days until the danger is passed.

Many of the reasons for the failure of the tree to live and grow after it has been planted can be ascribed to the injuries sustained in digging it up. The roots are torn, strained and mutilated or such scanty root system is taken up that the tree has no means of keeping up life. In digging up the tree the roots should be preserved as entire as possible and entirely practical. If the tree is of a dimension of an inch or two in diameter and of four or five years' growth, the root system should be preserved for at least three feet around the stem. Extreme caution should be exercised in retaining the small feeders. If a larger tree is taken up a ball of earth of the dimensions above should be kept compactly intact with it and planted. Having carefully dug the trees, the roots should be examined and cut away smoothly and completely all bruised and broken roots. By so doing decay will not occur and fibrous roots will form quickly around all such places. Top roots may be cut down to easy requirements for planting in the cavities. The tops of the trees should always be pruned back to harmonize with the diminished root system caused by digging. A good suggestion is the cutting of the branches back from one-third to one-half, but at no instance should they be cut to bare poles. In cutting the top back the branches should always be cut near a bud as the pruned member will always die back to the nearest bud. This will avoid the dead stubs so frequently seen on pruned trees a year or so after.

When trees are selected from the forest, they should be secured from regions open to the sun rather than from a densely shaded area, as trees from the latter places are tender and weak and will not survive the sun and open exposure. All newly planted trees should be protected on the extreme side to the sun exposure by boards or tree boxes. They should also be protected from stock and other dangers by tree boxes. Figs. 1 and 2 on following page give good forms of protection and are very simple in construction.

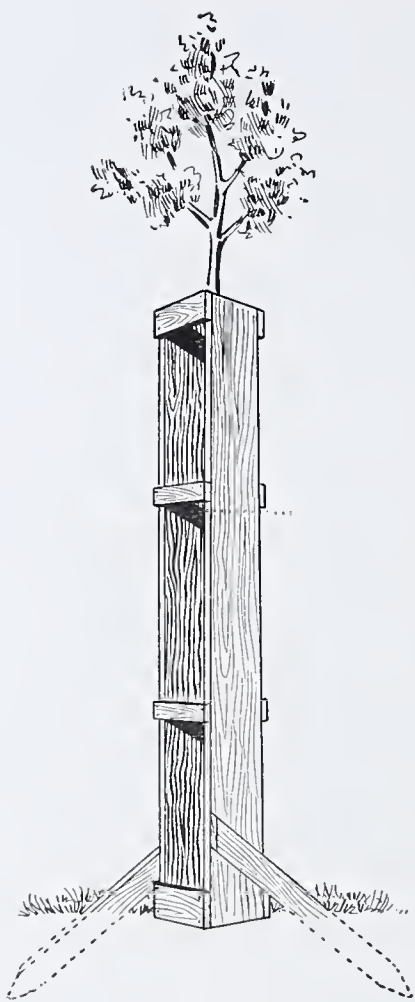


Fig. 1.



Fig. 2.

FORESTRY—PRACTICAL AND AESTHETIC.

Forestry is an issue that is rightfully receiving the earnest attention of the people very generally throughout the civilized world. I believe I assert the truth when I say that no other recent agitation has met with so great a responsive feeling among practical and intelligent people. The industrial, the professional, the educational and the commercial ranks are according to it a sincere recognition. I may state, however, with the same degree of truth, that while it is a subject of such universal regard, it is not a well defined subject, in scope and meaning, in the minds of a major part of our citizens. This condition can not be attributed to any fault or negligence upon the part of the people, but it is due entirely to the diversity of forestry application.

In speaking of this subject, before the American Forestry Association, President Roosevelt said: "Forestry is the preservation of the forests by a wise use of what they afford." This definition is extremely extensive, profoundly intensive and concisely complete. An analysis of this definition would demonstrate the benefits of forests everywhere, and also designate all the wisdom in the use of such benefits and in the preservation and perpetuation thereof. Such, to my mind, is forestry as our President understands it. Pinchot, the chief of the United States Bureau of Forestry, speaks of forestry as being the art of discovering and applying principles by which forests are best managed and continued to promote the interests of mankind in the great achievements of material and spiritual progress.

Forestry, then, from the two views given, and which I believe comprise the true sense of the institution, does not mean the cessation of the use of forest products, but the wise use thereof, and the discovery and application of forestry principles which will conserve and perpetuate forests to the people, because they are the most useful natural resources to man. The diversified interests of man, therefore, causes a diversity of the applications of the forest, and consequently results in a diverse understanding in the minds of the people. Interests in irrigation, the preservation

of the headwaters of streams, the modulation of climate, the industrial welfare, the fostering of science, the enhancement of commercial interests, the beautifying of the landscape and the numerous economic requirements all may and do have just claims for the promotion and rapid extension of scientific forestry in Indiana.

With these facts in mind I shall discuss the practical and aesthetic phases of forestry as to origin, development and possibilities. The practical phase applies to trees as they stand together in masses of extended area called forest, with the attendant animal and other plant life comprising the most highly organized portion of the vegetable world. The point of emphasis, however, is right tree cultivation and uses. Practical forestry may be traced in its origin to the creation. When God had created the mass called earth and had caused it to be divided into the parts, land and sea, he saw that it was incomplete for the abode of living creatures, and he therefore clothed it with plants and trees and pronounced it good. When he placed Adam and Eve in the Garden of Eden, he also placed therein trees for their comfort and benefit, but because of the fall of man in the Garden he was driven out and commanded to till the soil. By natural steps from that day to the present forests have been the principal agency of man in fulfilling his destiny, and must necessarily continue to be.

Prior to 690 A. D. forests were managed by individuals for their own promotion, but from that time to the present various laws have been enacted by nations relative to forests, either for their destruction or preservation, just as rulers saw their interests advanced by the one or the other. In 690 A. D. forests were protected by King Ine's laws, which provided that forests should be maintained for the purposes of hunting, fuel, building and the pannage of pigs. Heavy fines were imposed upon any one destroying a tree bearing fruit which pigs ate. In 1016, the Parliament of England passed what was known as the "Norman Forgery Act," for the royal appropriation of large forest tracts. In 1079, William the Conqueror passed an act for the "New Forest," which resulted in the destruction of thirty-six parish churches, together with the houses and townships, and the area was planted in forest as an abode for wild game. For almost three-quarters of a century following the reign of William the Conqueror, the King

Henrys wrestled with the forestry question, at times destroying and at other times preserving. From 1199 to 1216, King John afforested all of the country of Essex and Cornwall, which so banded the nobles against him that the Magna Charta resulted, and by 1225 the universal destruction of forests had set in throughout England and continued into the modern period of history until 1504, when King James IV passed an act preventing the destruction of green wood and compelling every landowner to plant an acre in timber, if his possessions had no forest area.

This act by King James reversed the tendency to forest devastation, and by 1523 a systematic forestry plan was established in England and young men were encouraged to educate themselves concerning the subject. At the present time practically all the States of Europe have well-settled forest policies, with strongly increasing tendencies by governmental activities. England, in the home country, has 60,000 acres of forest under state control, and in India, 38,400,000 acres in reserve, and 22,137,600 acres protected by government laws. Schools in both England and India supply technical education on the subject. Germany possesses as state property 11,360,000 acres; under state management, but managed by individuals, 2,212,000 acres; under governmental control 3,875,000 acres, and under state inspection 4,767,000 acres. France has under systematic control and supervision 16,880,390 acres. Russia has under strict governmental control 600,000,000 acres. The other states of Europe have not progressed as materially in forestry matters as the ones just mentioned, but are more or less well organized and active.

Forestry in the United States does not show the history that it does in Europe. The early settlers of the colonies, because of their English experience, provided measures for the care and preservation of forests, but they never became forceful. In 1779, Congress passed an act for the purchase of timber suitable for navy uses and augmented the act in 1817 and again in 1831. As a result legal provisions were made for the purchase and preservation of 244,000 acres of forest in Florida, Alabama, Mississippi and Louisiana. Nothing further, however, was done to stimulate forestry until the close of the Civil War, when the influences of railroad construction and extension of the timber commerce re-

vived the subject of timber preservation. In 1867 Wisconsin appointed a committee to report the results of timber destruction, and in 1869 Maine followed by formulating a definite policy for tree planting. From 1868 to 1878 nine Western and two Eastern States passed laws for tree planting, mostly in the form of homestead claims. In 1873 actual forestry in the United States began. At that time the American Association for the Advancement of Science, which held a meeting at Portland, Maine, memorialized Congress to enact legislation for the preservation and cultivation of timber. In 1891 the President was granted the power to set aside any part of the public lands, wholly or in part covered with timber, as public reservations. By this method 18,000,000 acres were set aside. In 1896 the Secretary of the Interior inaugurated a fixed forest policy, and appointed, in conjunction with the Academy of Science, a committee of seven persons to investigate and report other reservations. This action resulted in the establishment of eleven other reserves, aggregating 21,000,000 acres. These reservations have been increased to twenty-six in number, having a total area of 58,850,925 acres, and requiring an annual expenditure for management of about \$300,000.00. In addition, a system of forestry conduct has been established throughout the United States. Individual States have also encouraged and augmented the work by the passage of practical forestry laws and by the organization of State forestry commissions.

This condition of forestry advancement, both in Europe and in the United States, is the outgrowth of the act of King James in 1504. It was he who, four hundred years ago, first saw that the forests of Scotland were almost devastated, and this observation caused him to inaugurate his laws for forest preservation and cultivation. The condition of England at that time is the condition that obtains throughout the United States and in our own Indiana at this time, and the same circumstances which forced King James to action are now compelling us to act along the same line. It has taken four hundred years for this issue to reach us from the time of its inception in Europe, and it has grown out of the natural conditions and demands, just as it did in Europe. I would earnestly impress upon the young men and young women upon whose shoulders will rest the responsibilities of the future welfare, that this for-

estry movement is not a fad originated by a feeling of mere sentiment, but that it is a stern necessity owing to the rapid disappearance of the generous gifts which nature bestowed upon us. Just as all the other beneficial stages of progress in civilization, such as science, art, literature, education and religion, have reached us by the westward march of advancement, so has forestry come to us from the continent of Europe, along with the tide of high civilization, in its onward career around the globe. Such, then, is the origin and growth of forestry, and its possibilities are so numerous and apparent that I confidently believe it will open to young men of learning and energy a valuable field of activity.

I believe that forestry will have a conspicuous and prominent place in the future education of this country, from the fact that conditions will make it absolutely necessary, and because it is having a large place in the education of the countries of Europe. The industrial, the scientific and the economic requirements will demand it. Forestry, as a science issue, is far-reaching in its scope and influence. It only remains for time to perfect it. In the industries, the great part which wood has, as a material, makes it an essential product. The present inadequate supply of wood in all countries is rapidly developing the question of extensive forestry action. The perpetuation of the forests to supply the wood product for the industrial demands will evolve forest propagation. The growing and preserving of forests will develop the science of forest biology. The necessary and natural economy in the use of wood will develop the study of wood phenomena, or the science of timber physics. Hence, these things which I have enumerated as grounds for influence lead me to the firm belief that the present nature study now being introduced into the primary schools will largely cover the ground of study in science which is now done by the high schools, and that forest biology and timber physics will be given the more prominent place in higher, technical education. This seems to me the more reasonable conclusion, because there is scarcely a phase of natural science which is not more or less directly affected by the extension and promotion of forests. In the development of these two branches of science the saying, "Science is man's truest friend and most noble helper," will find a rich field for demonstration. It was for the development and perfection of these aims that the

bill for the establishment of a practical forestry laboratory and experimental reservation of two thousand acres was introduced and enacted into law by the last General Assembly of the State—that the principles of forestry may be discovered and applied for the education and information of the people.

Forestry is not a matter of a year's time. It is a concern of quarter, half and whole centuries. It is a philanthropic movement in which preceding generations shall look to the welfare of those following them. One life shall perpetuate another.

Aesthetic forestry, better defined as arboriculture, has reference more particularly to individual trees. It more properly applies to the aim for which they are cultivated—landscape embellishment, the beautifying of yards and lawns, the establishment of parks and drives, and the fringing of lanes and highways. The primary object of such forestry is beauty, the rhythmical arrangement of the outer world to please the true inward soul. When the external world is so diversely arranged as to produce a unity of feeling in the observer, it is beautiful to him. Tree planting for the purposes above indicated will add greatly to the rhythmical appearance of the surroundings and make them attractive. The same principle is involved in this that causes the home to be decorated and furnished artistically, or the dress to be tidy and varied. It is this same principle that induces the merchant to attract trade by means of beautiful show windows, humorous advertisements and grand openings. It is the same object which actuates the manufacturer to design most artistically and finish most elaborately the products of his establishment. It is this same life attribute which causes amusements to be varied and clothed with all the emotional bearings that the intelligence and the theme will permit. It is the revival of the old Greek principle. They understood this beauty more than any other people, and they demonstrated it in the erection of their public buildings and monuments, in decorating them with art and sculpture, and in the adornment of their streets and parks. Beauty to them was the highest principle and utility, and their works of art endure as models of refined taste.

It was, no doubt, to some degree, this lack of rhythmical attraction at the Creation which caused God to clothe the earth with

verdure. It is diversity, whether of natural or artificial design, which makes us satisfied and forms largely our character. A person from the dreary plains revels with delight in the forests and trees. To him they form the elements of a paradise. To us the first sight of the plains is pleasing, but it very soon becomes monotonous, and the stray cow on a distant knoll, the cowboy and his herd, the prairie dog and even the solitary crow are most welcome objects to convince us that we have not left the world. Too much of sameness produces displeasure and dissatisfaction. Trees possess elements of diversity in more forms and to greater extent than any other living plant, and of all trees none are more beautiful than the natural forest trees of Indiana. The maple, the oaks, the gum, the poplar, the elm, the ash, the linden, the redbud and the dogwood are not surpassed in brilliancy of foliage, either in the spring, summer or autumn, by any other species. The dark green, the scarlet, the crimson, the yellow, the purple, and the deep red of the foliage in its transitory changes from spring to autumn have no equal comparison in natural beauty. These trees are clean, majestic and strong, hardy against insects and defiant to storms. He who plants them is a believer of the words of Irving: He who plants them looks forward to future ages, and plants for posterity. The work which he does will grow better year by year for generations. There is nothing to prevent us from making the world about us beautiful with trees, pleasant with shade, pure with blossoms, and cheerful with the songs of birds, gay flowers and green grass, but ourselves and nature. By them we can make the world a part of ourselves. With every green tree that surrounds us with its leafy foliage, with every shrub by the roadside where we walk, with every grass blade that bends to the breeze in the field through which we pass, with every flower that springs from the earth and smiles to meet the sun, and with every bird that springs from twig to twig and sings its song of freedom, we should have a natural relationship, and they should be a part of our lives.

There is something unspeakably delightful in the spot of ground covered with trees, flowers and grass, and there is nothing which so strongly endears one to a place as bright memories of a life due to a cheerful home with pleasant surroundings. Pleasure can not exist amid bleakness and cheerlessness.

HISTORY AND CHARACTERISTICS OF SPECIAL TREES.

THE OAKS.

There are about thirty species of oaks growing native in the United States. Of this number seventeen are known to be growing native in Indiana, though a few of the species are rare and very local.

The oaks, as a whole, are the most useful trees for general requirements, and this fact has resulted in their almost total extermination. The oaks possess ornamental qualities much beyond the estimate generally accorded them.

The ancients revered the oaks and attributed to them the mystic power to foretell coming events. The oaks are connected with the establishment of the two oracles of Jupiter at Dodona, and in the Lybian oasis by the two black doves which flew simultaneously from Thebes in Egypt. Tennyson, in his "English Idyll," characterized the lover as "The Talking Oak" in exclaiming the knowledge told him of his sweetheart, Oliva. Hercules, it is remembered, carried an oaken club.

The oaks for ornamental plantings can be purchased from reliable nursery firms, where they have been given a series of transplantings and root prunings which insure their success when planted at large sizes on lawns and in parks. The seedlings may be grown from acorns in a home nursery bed and transplanted at an age of two or three years to their permanent places with quite good success. The seedlings may also be taken from the forest and transplanted to their permanent places, but if too large a tree is transplanted, success can not be assured.

THE OAK.

What gnarled stretch, what depth of shade, is his!
 There needs no crown to mark the forest's king;
 How in his leaves outshines full summer's bliss!
 Sun, storm, rain, dew, to him their tribute bring,
 Which he with such benignant royalty
 Accepts, as overpayeth what is lent;
 All nature seems his vassal proud to be,
 And cunning only for his ornament.

How towers he, too, amid the billowed snows,
 An unquelled exile from the summer's throne,
 Whose plain, uninctured front more kingly shows,
 Now that the obscuring courtier leaves are frown.
 His boughs make music of the winter air,
 Jeweled with sleet, like some cathedral front
 Where clinging snow-flakes with quaint art repair
 The dints and furrows of time's envious brunt.

How doth his patient strength the rude March wind
 Persuade to seem glad breaths of summer breeze,
 And win the soil that fain would be unkind,
 To swell his revenues with proud increase!
 He is the gem; and all the landscape wide
 (So doth his grandeur isolate the sense)
 Seems but the setting, worthless all beside,
 An empty socket, were he fallen thence.

—From Lowell's Oak.

WHITE OAK.

The white oak stands first of all in usefulness and noble characteristics. It fitly symbolizes some of the noblest traits of character, and its massive trunk and giant branches, when fully grown, embody that stability and strength which we admire in man. By its deep rooting it anchors itself against winds and tempests and grows for centuries. There are now standing in New England some white oak trees which are known to have been of good size when the struggle for independence was waging.

The white oak grown in open grounds is an object of scenic grandeur. Its majestic head is a mighty dome of beauty, and its smooth body and limbs compel admiration. It grows in all ordinary soils, and flowers in May and June.

It seems peculiar in early spring to see these great gray trees putting forth leaves as tender tinted and pink as many a timid

flower. In their autumn childhood the leaves have a deep, ruddy, wine hue.

The leaves of the white oak are short-stemmed, with an acute base, three to nine obtuse, entire, oblique lobes, with a persistent clinging tendency in winter. The leaves are pubescent when young, but are smooth and bright green above.

The acorns grow in the axils of the leaves and are ovoid, oblong, and set in a shallow round cup. The seeds ripen in September and October, at which time they should be cured and stored by the process of stratification for planting in the spring in nursery beds.

BLACK OAK.

The black oak is a very common oak, and is usually found in connection with red oak, hickories and maples. It is frequently taken for red oak, but may be distinguished therefrom by its yellow inner and nearly black, scaly and rough outside barks. It grows on either dry or wet uplands. Single trees grown in open ground are models of sylvan beauty. This tree as an ornamental species is very greatly underestimated. It flowers in May and June.

The leaves are deeply pinnatifid and much like the red oak. In spring the leaves are red, but turn to silvery green when the tree blooms. They are rich red in autumn hue, but do not have the vivid touch of color so characteristic of the scarlet oak. The acorns are nearly round and set in a deep scaly cup and ripen in September and October. The requirements for planting are the same as for the white oak.

RED OAK.

The red oak is well distributed over the State and grows in moist, cool localities. It is closely related to the black oak, but easily distinguished therefrom by its more upright habit, smooth, lighter-colored bark, and by its shallow-cupped acorns. Planted in open ground it forms a majestic rounded head, with clean, smooth limbs. It is a rapid grower, but a little difficult to transplant; hence well treated trees should be selected for planting. It flowers in May and June.



A BLACK OAK GROWING NATURAL IN WOOD-LOT IN SOUTHERN INDIANA.

The leaves of this tree are smooth, thin, oblong, pinnatifid, sometimes very much so, eight to twelve sharply toothed lobes, and turn dark red after a frost. Usually its foliage is dense, but it has no semblance of heaviness. The unequal lobes of the leaves, with bristle-pointed teeth, give a light, pleasing appearance to the tree. They also lack the brilliancy of the foliage so charming to the scarlet oak. When growing under favorable conditions the red oak produces a very admirable effect. It has been the most successfully grown oak in Europe, because it readily adapts itself to varying climatic conditions. The acorns are oblong-ovoid and are set in a large shallow cup with fine scales and a narrow raised border. The acorns are almost sessile.

SCARLET OAK.

The scarlet oak is generally found throughout the State, but more abundantly in the southern part. It is found in connection with the black oak, but is distinguished from that tree by its much more finely divided branches and rough, grayish-brown outer and inner reddish bark. The scenic effects of this tree alone should commend it. Its leaves are almost skeleton in outline and are intensely beautiful in their autumn hues of scarlet.

All minor characteristics of the scarlet oak seem to be buried in the bright brilliancy of its autumn foliage, which has the most exquisite tint displayed by any of the oaks. The leaves at unfolding are as red as in the instances given for the red and white oaks. The scarlet oak at all times is a charmingly gay tree for landscapes and surpasses accounts given of it.

This tree contrasts beautifully with the black oak in foliage, which takes the sober shades of buff and orange. The leaves of the scarlet oak ordinarily are bright green and shining above, broadly oval, deeply pinnatifid, five to nine lobes, slightly cut-toothed, with bristle tips, rounded notches and slender, yellow midrib. The acorns are roundish, depressed, one-half inclosed in a top-shaped, coarsely scaled cup, and are located in the axils of the leaf scars of the preceding year.

PIN OAK.

The pin oak is a very handsome, medium sized tree, mostly found in the southern part of the State, although it grows sparingly in the northern part. It is especially adapted to wet, rich soils of streams and swamps. It is a moderately graceful and ornamental tree for lawn and avenue planting, though it becomes straggling with age. It has a peculiar beauty, because of its drooping branches and dark greenish-brown, rough, slightly furrowed outer and reddish inner barks. The leaves are oblong, deeply pinnatifid, sharply toothed, bristle-tipped, divergent lobed, rounded notches, and both sides bright green. They strongly resemble those of the scarlet oak, but they are smaller and the sinuses extend almost to the midrib, which, though small in variation, changes the tree to a light, delicate, pretty appearance. The autumn hue is a rich red. The great abundance of galls has a bad effect in estimating the value of the pin oak as an ornamental tree. The acorns are globular, set in shallow, saucer-shaped cups, almost sessile and found in the axils of the leaf scars of the preceding year.

THE MAPLES.

The maples are among the most desirable trees for ornamental planting found in the State. There are about ten species growing native in the United States, and of this number seven are known to be native in Indiana. They possess qualities which make them excellent shade trees. Some of the species are rapid growers, while others are not. They have peculiar characteristics of soil adaptations and moisture that must be taken into consideration when they are planted. The flowers are terminal racemes.

"The lovely maple, fair is seen
Emerald robed, crowned sylvan queen."

SUGAR MAPLE.

The sugar maple is found naturally abundant throughout the State in all rich, upland soils. It is a great favorite for the street and home ground planting. This tree may be made to have several forms of crown, not by trimming, but by the manner of



A SUGAR MAPLE NATURAL FORMED IN FARMYARD OF ANDREW BLACK, NEAR
GREENCASTLE, INDIANA.



A SUGAR MAPLE GROWING IN WOOD-LOT, NORTHERN INDIANA, SHOWING THE FORM
WHEN UNHAMPERED BY TRIMMING.

planting. In open ground it forms a broad, orbicular top; when crowded it forms a cylindrical crown, and in natural conditions a symmetrical head. In all forms the crown is well-balanced and erect. No other tree is so neat and clean from the time of leaf expanding till the end of its autumn foliage, nor so free from attacks by insects and worms. It is hardy, and recovers from shocks which would insure death to most species. This tree should be guarded from tree butchers under the assumed name of tree trimmers. Most frequently they are best when left alone.

The sugar maple flowers from February to April, according to season and soil, and the seeds ripen in September and October. The flowers hang in umbel-shaped clusters at the time of leaf expansion in the spring. The fruit is winged-shaped, with strong tendencies to form right angles.

The sugar maple bears planting well, but trees of large size should have had the transplanting treatment before the permanent planting, the same as the oaks, though seedlings may be grown from seeds sown in a nursery bed in the spring after they have been stored in sand during the winter.

The leaves are deeply three to five acute-lobed, few-toothed, rounded notches, base hearted, glaucous beneath, smooth and green above.

THE SUGAR MAPLE.

When first the sun begins to warm
 The sleeping earth's long frozen form,
 And bearing on his northern way,
 To melt the icicles by day
 Which winter, still with equal might,
 Congeals and forms again at night;
 O! who shall name in scornful mood
 That sweet, delicious, glorious flood,
 That perfect saccharinean sea,
 That floweth from the maple tree?

—Benjamin S. Parker.

RED MAPLE.

The red maple is very common throughout the State in low, wet soils. It is the most brilliant tree in autumn. The tree flowers in March and April, and the seeds ripen in May and June. The red maple has a clearer head and darker aspect than the sugar

maple. Its early blossoms are attractive and its autumn foliage is a perfect banquet of color.

The red maple thrives excellently around country homes, where the moisture and drainage conditions are more suited to it than in cities. It is a surface rooted tree, and hence not adapted to the conditions found where paving and gas and water piping prevail. It is an easily transplanted tree, and large trees can be transplanted successfully.

The leaves of the red maple are cordate at the base, cleft into three to five acute-notched, irregularly toothed lobes. The leaves are whitish underneath and smooth green above, but turn bright crimson in early autumn. The seed is winged and inclined to form a right angle.

AMERICAN ELM.

The white elm grows native throughout Indiana in soils of every character. It has considerable sentiment attached to it. The elm is associated with the "Well-Sweep" and "The Old Oaken Bucket." It was of the elm that Lincoln exclaimed, when returning from the army encampment at Washington he stopped his carriage to admire the grand tree, "Such a tree is one of the noblest objects of creation!" Bryant was inspired by the elm to an expression in the poem, "Forest Hymn," and Holmes said, "The best poems I have ever written are the trees I have planted."

There is a grandeur of thought in conserving and planting these glorious sons of the forest. No other tree combines so much vastness, grace and beauty as the elm. It bends to the wind and thus is less broken by storms that injure other classes of trees. It is well adapted for wide avenues, but the lines should be such that they will not be cramped for room to spread. It has more diversity of form than any other tree and should never be topped, but allowed to grow naturally, or it will become ill-shaped.

The elm flowers in April in numerous clusters fringed with long trimmed spray, which becomes so dense at times as to obscure the branches. The seed ripens in May and June. They are light and chaffy and are easily blown hither and thither by the winds. The leaves are about two or three inches long, oval, abruptly sharp pointed, sharply serrated, pubescent beneath when young, but soon smooth.



WHITE ASH GROWING BY ROADSIDE IN SOUTHERN INDIANA.

The tree is most beautiful in June, soon after the leaves are expanded, but its autumn foliage possesses no brilliant hues. It increases in beauty with age. It is fairly easy to transplant.

“The elm is a kindly, goodly tree,
 With its branches bending low;
 The heart is glad when its form we see,
 As we list to the river’s flow.
 Ay! the heart is glad and the pulses bound,
 And joy illumines the face
 Whenever a goodly elm is found,
 Because of its beauty and grace.”

AMERICAN ASH.

This species of tree is distributed generally over the State in rich soils. It forms a very attractive picture of rare grace and beauty in the forest. When not crowded, it grows a stout body with a stately, widespreading head. The limbs are smooth, clean and numerous, but not twiggy, and begin low on the body. The compound leaves form a delightful shade, but the two faults and drawbacks are that they put forth late and fall early. Its foliage is free from attacks by insects. The ash is a good tree to alternate with maples.

The leaflets, usually seven to nine grouped, are stalked lance-oblong, pointed, shining above, pale beneath and somewhat or entire toothed. The white ash flowers in May and the seeds ripen in September and October. It has stamens and pistils borne on separate trees, and thus only a part of the trees seed. The seeds are winged. The bark on the body of the ash is gray, furrowed, grayish-green on the branches and the buds are rusty in color. This tree is extensively cultivated for ornament.

THE LIN OR BASSWOOD.

The lin is well distributed throughout Indiana in all rich soils. All persons who see the desirable points in trees for shade find it an attractive tree because of its generous, well-shaped leaves and landscape effects. The fragrant blossoms are succeeded by the small globular one-seeded fruit, which ripens in September

and October. It is said of the lin that for ornamental purposes it has no equal, and is largely cultivated for landscape ornament.

Whether in bloom or in fruit the lin is an interesting study. It possesses two distinct shades of green—the dark green of its leaves and the light apple green of its bracts. The leaves are large, more or less heart-shaped, soft and downy, green and somewhat thick. The flowers are cream colored and fragrant, with five spatulate oblong petals hanging in clusters from a slender peduncle.

AMERICAN CHESTNUT.

Hitherto the American chestnut has not been planted on our streets or roads; but there is no good reason why it should not be given a place occasionally. It grows very fast, attains a large size, is handsome in form and proportion, and fulfills all the requirements of a first-class shade tree. The boys might prove troublesome when the fruit is ripening; but that is all that can be said in objection, a difficulty easily obviated by a little police work during the short time in which the burs are opening. The chestnut, too, is not without its claim to beauty. In July its branches are covered with a profusion of cream colored catkins that attract the eye and enable one to identify it then, even at a great distance.

HACKBERRY.

The hackberry is a medium sized tree, which, in its general appearance, resembles the elm. Its straight trunk does not divide until it has attained considerable height, a peculiarity which is an advantage in a street tree; but, as its roots generally rise above the ground for some distance from the trunk it is better adapted to village streets or wide avenues, where the flagstones of the sidewalk do not extend to the curb. While it is not a tree of the first magnitude, it is generally too large for narrow streets. Though a native it is rarely found in our woods; but young trees can always be obtained from nurseries. It is so uncommon that, aside from



LIN, OR BASSWOOD, GROWING NATURAL IN BORDER OF FOREST NEAR
ANDERSON, INDIANA.



A SYCAMORE GROWING IN WOOD-LOT IN SOUTHERN INDIANA.

botanists, foresters, or lovers of trees, it is seldom recognized by its right name. There are places in New York where some lone specimen is described by the people in its vicinity as "the lost tree" or the "unknown tree," and is the subject of marvelous stories as to its origin or characteristics. The hackberry is easily identified, however, by its elm-like leaf and habit, by its peculiar bark, covered with hard, warty, excrecences, and by the small, dark red, berry-shaped fruit, which clings to the stems long after the leaves have fallen—often during the entire winter. Its rapid growth under all ordinary conditions of soil or climate, together with its freedom from disease and insects, entitles it to consideration in making a selection.

SYCAMORE.

Where rapid growth and great size is desired, the sycamore or buttonwood, may claim a place. Its lower branches are high above the ground, affording an open space beneath the tree—which is often desirable when planted near a house—and furnishing ample shade without obstructing the view of the street or road; but owing to its irregular, inferior habit and liability to fungal diseases, it should be used sparingly in streets or parks, and only where variety is desired. The European sycamore, or oriental plane, which resembles the American species closely, is preferable in every respect, and can be obtained from any nursery. The sycamore is easily recognized by its peculiar bark, which falls off in flakes from the lower part of the trunk, giving that portion of the tree a scabby, spotted appearance, while the upper part of the trunk and the branches are smooth and of a creamy white. It is known also by the "buttonballs" hanging from its branches, a dry, globular fruit filled with seeds, and conspicuous in winter. Tree students, in their outdoor studies, are always pleased to note the conical bud hidden under the base of each leaf stalk and fitting so nicely into the cone-shaped recess in the petiole. It is an interesting tree, and, as found in the lowlands of the Mississippi basin, is the largest of all our deciduous species. The Thames Embankment Boulevard, a famous avenue in London, is lined with sycamores.

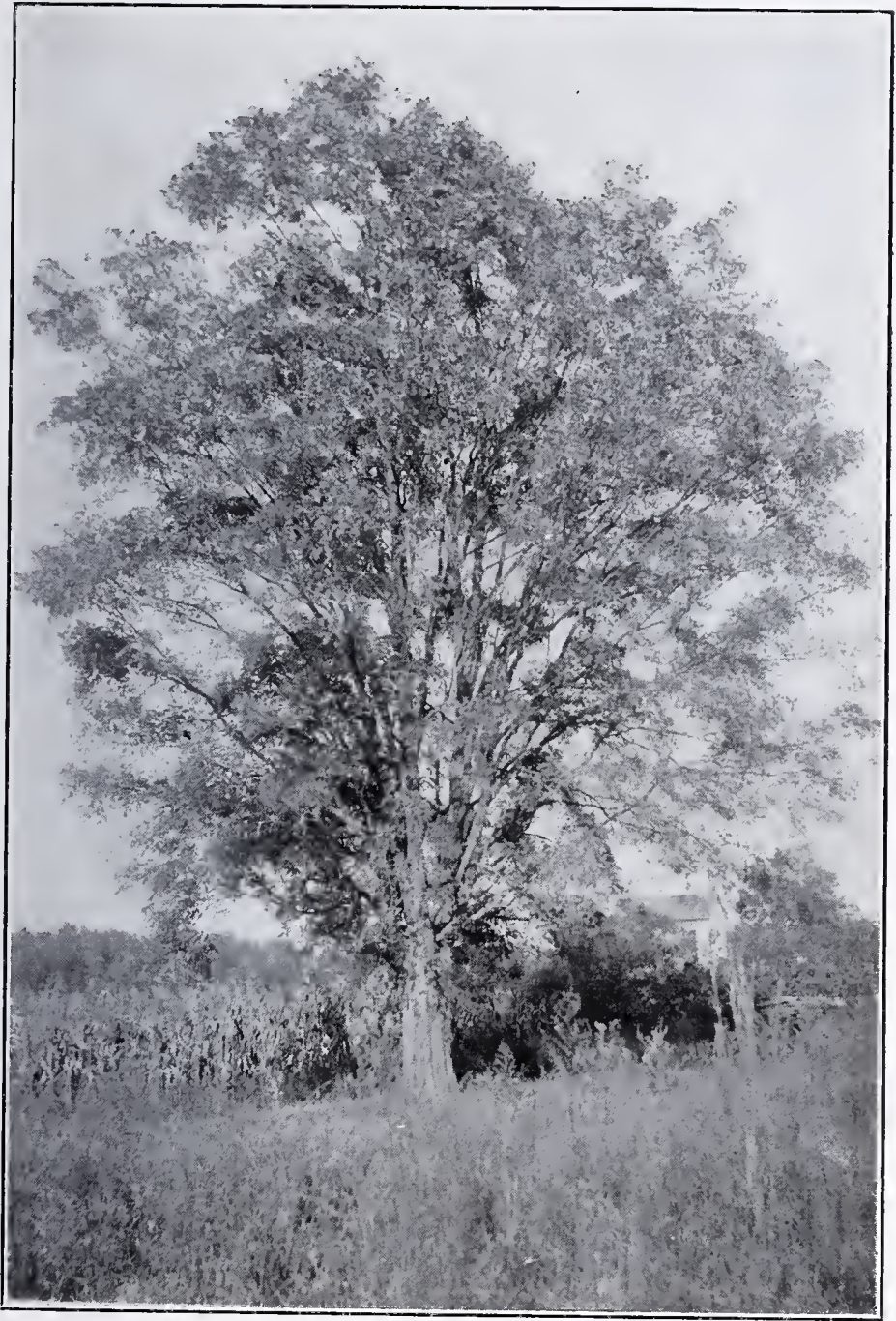
YELLOW LOCUST.

The common yellow locust is one of our most beautiful trees on account of its profusion of pinnate leaves, and the pendant racemes of white flowers which in June fill the air with an agreeable perfume. The locust is reputed to be a favorite nesting place for birds, its spiny stipules furnishing protection from many of their enemies. Professor Sargent, in his *Silva of North America*, notes that the yellow locust continues to grow until the beginning of autumn, and that the ends of the branches in summer are covered with young light yellow-green leaves which stand out conspicuously against the dark background of the older foliage. This tree grows rapidly, and its size makes it available for streets of medium, rather than narrow-width: but owing to the brittle character of its branches it should not be placed where it will be exposed to strong winds. This species has one peculiar advantage as a lawn or roadside tree in that the grass beneath its shade is always green owing to the fertilizing property of its leaves, which like all leguminous plants enriches the soil.

THE YELLOW POPLAR.

Naturally this tree is found in all parts of the State. In the early history of Indiana it was one of the most numerous and largest of trees. It and the elm are very much in contrast. In forests it is tall and stately of trunk, but when transplanted from the nursery on open lawns and parks it becomes a tree of architectural and symmetrical beauty, and is frequently clothed to the ground. It harmonizes well with dressed grounds and artificial surroundings. The lively green leaves of summer and the orange shades of autumn make it an attractive tree for all the season.

In the spring, when covered with its tulip-like flowers, it is a pleasing sight. Freely and unconsciously it throws its blooms out as though it were some lively wayside flower. In cultivation the tree is a great favorite, and when young has a high-bred expression. Persons desiring a fine ornamental tree, clean and attractive, will find it worthy of consideration.



A YELLOW LOCUST GROWING IN EDGE OF FIELD IN SOUTHERN INDIANA.



A YELLOW POPLAR GROWING NATURAL IN OPEN FOREST NEAR
GREENCASTLE, INDIANA.

The trees for planting should have been given the transplanting process, though they may be grown very successfully from cuttings or from seedlings produced in a nursery bed.

The poplar flowers in May and June, according to season and soil where found. The flowers are tulip-shaped, large greenish-yellow, growing on stout peduncles. The fruit is a pointed cone and hangs on until autumn. The leaves are large, smooth, three-lobed, with the end of one lobe seemingly cut off; stipules are light colored, large, oblong, attached entirely around the stem.

THE SWEET GUM.

The sweet gum is common to the southern counties of the State, but is rarely found in the northern part. It is a tree somewhat resembling the sugar maple, but has a conical head and widely branching limbs inclined upward at the ends. The bark is very rough and of a reddish brown color. The gum is a rapid grower, adapted to most any soil, and because of the peculiarity of all parts it is a most excellent tree for planting on lawns, parks and avenues.

This very beautiful tree has many distinctive features. It seems to evade all conventional patterns and is purely chaste and original. Every year finds it more extensively planted, and in beauty and outline it is said to be unrivaled. It is almost free from the ravages of insects and borers.

In autumn the foliage turns a rich orange and crimson color, and the curious shaped twigs with corky ridges add to its great beauty. The leaves are roundish, star-shaped, five to seven-pointed lobes, dark green, smooth and shining. The tree flowers in April and May and the fruit ripens in autumn. The tree is easy to transplant.

REDBUD.

The redbud grows abundantly throughout the State in almost every variety of soil, but most thriftily in rich loams. It is found in sizes from a small shrub to a tree of twenty to thirty feet high. It forms a handsome little tree with smooth bark, and in the springtime is aflame with bright, red-purple flowers; hence it is

very attractive on lawns. The flowers hang in sessile clusters before the leaves appear and cover the twigs entirely. The tree is scarcely less beautiful in autumn than when it is in flower.

The leaves are broad, heart-shaped, acutely pointed, dark green, smooth and glossy. Trees should have been transplanted before they are set on the lawn or any other permanent place. It is a rapid growing tree when under cultivation, and hence a valuable tree to plant for parks and lawns.

FLOWERING DOGWOOD.

The flowering dogwood is found in all parts of the State, but more abundantly and larger in the southern counties. It is a tree conspicuous for its flowers, and its autumn foliage is just as attractive; hence it is a most admirable tree for ornamental purposes. It flowers in the spring, making it a most striking tree in a forest or on the lawn.

There are few persons who do not appreciate the beauty of the dogwood when its bloom whitens the woods and banks in the spring. The involucre of the flowers unfold before the leaves are fully developed and can be seen at a great distance waving their cheery message of spring.

This tree should be more highly cultivated and planted. For roadside planting it can not be equaled. A variety with pink flowers is now cultivated in nurseries. The leaves are ovate, pointed, acute, bare and smooth on both sides. The bark is reddish tinted and rough, adding to the other ornamental features which the tree possesses. Trees of any size should have been given a good transplanting process before planting on lawns or open areas. Seedlings grown in the home nursery and transplanted to permanent places when three or four years old will do very well.



A GROUP OF SWEET GUM SHOWING DENSENESS OF FOLIAGE AND CONICAL
FORM OF TOP.

SERVICE-BERRY.

The service berry is classed as a shrub, but it reaches the size of fifty feet in height and twelve inches in diameter under cultivation, and hence is a valuable tree for lawn ornamentation. It grows in all parts of the State, in both wet and dry soils. It is among the first trees to bloom, and is most conspicuous because of its many white flowers hanging in racemes of great abundance.

There is no passing it by; it is one of the spirits of nature that the dullest eye must perceive and admire. The fleecy white petals wave and beckon as if to attract attention and at the season of the year when there is but little foliage. It is a sign that grateful spring is on the way. There are many varieties of this species.

The leaves are either narrow, oblong or roundish and in clusters with bracts, bright green and smooth. The fruit is a small purple berry, and very edible. It ripens in June. This tree is easily transplanted and may be grown from seeds in a home nursery bed.



A REDBUD BUSH GROWING ON BANK OF STREAM IN THE FOREST.

AUTUMN FOLIAGE.

Extract of an article from "Tree Planting on Streets and Highways," by William F. Fox, Superintendent of State Forests, Albany, New York. The same applies to foliage for Indiana forest trees:

In the selection of species for street and highway planting some consideration should be given to the colors which the leaves will display in the fall months, a matter as important as that of tree habit or graceful outline. Although a purely esthetic one, its importance has been urged at times by scientists as well as writers on woodland scenery. We hail with pleasure the green foliage of each returning spring, but delight none the less in the brilliant display made by the painted leaves in autumn, and, so, when we come to choose our trees for planting, everything else being equal, why not give a preference to the species which afford a pleasing aspect in both spring and fall?

In considering this question it is well to remember that, while certain species generally show the same color each fall, there is apt to be some variation in this respect. Occasionally some individual will exhibit an entirely different tint from the prevailing one of that species, while frequently several tints, and at times two or more distinct colors, will be found on the same tree. The red maple is noted for the scarlet hue of its leaves in early fall; but here and there a tree of this species will display a yellow foliage at that season.

Most of our oaks are a brilliant red or scarlet in October, but some of them change each autumn from green to russet without the usual intermediate bright tints that generally precede the russet. The hard, or sugar maple, can not be classified under any one particular color, for it not only displays various ones on the same tree, but green, yellow, and red are often found on the same leaf. The leaves on some species, the white ash, for instance, show three or four successive tints during their transition, passing from yellow to a beautiful shade of brown. On some trees, noticeably the red maple, a single branch will assume a brilliant color, generally red in August, while the rest of the foliage is still green. This may be attributed to some lack of vitality in the particular branch thus affected.

It has been observed that when a tree shows a distinctive sport of this kind the peculiarity is a persistent one, and its recurrence may be looked for each year. If a red maple displays one highly colored branch in early August, while all the rest of its foliage is green, it may be depended upon to exhibit the same phenomenon next season. On some oaks the leaves, instead of turning red, change from green to yellow or russet; but, whatever the peculiarity in this respect, each individual will retain it in a marked degree year after year. The persistency of this abnormal variation in color has been observed so often that the reasonable sugges-

tion is made that horticulturists and nurserymen might be able, by using cuttings or grains from trees or branches that exhibit a constant color, to propagate trees of desirable autumn tints and furnish stock to their customers, warranted to display certain attractive features in this respect.

There seems to be a popular impression that the period in which our forests display their autumnal beauty is of brief duration. A little thought and observation will show that this is hardly the case. By the first of August, throughout the Middle States, many of our soft maples display their scarlet standards of approaching fall; in September the forests are at their best; in October the woodlands along our valleys, and the trees that line our village streets, present their most brilliant effects; and even in November the persistent russet leaves of the oaks are still in pleasing evidence, while here and there on some late maturing trees may be seen a faint glow betiding this twilight season of the year. Thus we have four months in which to study this pleasing exhibit of Nature, a period nearly as long as that in which this vernal foliage retains its uniformity of green. It would seem, however, that the annual recurrence of this lavish display is not appreciated as it should be, that little attention is paid to it aside from the few who delight in Nature study. Thoreau very justly remarks that "If such a phenomenon occurred but once it would be handed down by tradition to posterity, and get into mythology at last."

Like the procession of the seasons the various tree species assume their autumnal garb in a regular order. In some localities it may be early or late; but, then, our spring or fall does not always arrive in accordance with the almanac. Here and there individual trees may be slow in donning their gay livery; and there are spots where winter lingers, though all around the land is warm with returning spring.

To give the exact order in which the trees turn color would require too many exceptions and explanations. As the maturing of the foliage occupies a period of about three months the species may be divided into three groups showing their order in this respect, although no group can be assigned with accuracy to any one month. Their succession is approximately as follows:

Group One—The Earliest.

Red maples, white elm, yellow locust, sour gum, horse chestnut, yellow birch, hickories, tulip trees, sassafras, hickorynut, black walnut.

Group Two—The Intermediate.

Hard or sugar maple, sweet gum, chestnut, red oak, pin oak, beech, white birch, black birch, aspens, white ash, basswood.

Group Three—The Latest.

Scarlet oak, dogwood, honey locust, Lombardy poplar, white oak, black cherry, sycamore, Norway maple.

Although, as previously shown, some species may exhibit two or more colors, there are certain prevailing tints which may be looked for in connection with each. Observers may differ some as to the shades noted, and it must be conceded that no classification can be made that will be absolutely comprehensive and correct. The following schedule is submitted as tentative rather than final:

PREVAILING COLORS.

Pure Yellow.—Tulip tree, yellow and canoe birches, yellow locust, honey locust Norway maple, beech, willow.

Yellow Ochre.—Poplar, aspen.

Lemon Yellow.—Hickories, black walnut.

Dull Yellow.—White elm, chestnut, white birch, basswood, butternut, catalpa, cottonwood, bur oak.

Vandyke Brown.—Sycamore or buttonwood.

Orange.—Horse chestnut.

Red.—Scarlet oak, dogwood.

Scarlet, Crimson and Yellow.—Red maple.

Red, Yellow and Green.—Hard maple, sassafras.

Purplish Red.—Red Oak.

Red and Russet.—Black oak, white oak.

Red, Yellow and Brown.—Sweet gum.

Brown, Purple and Salmon.—White ash.

The collector of specimens will find it difficult to secure perfect leaves of a straight color, ones in which the entire surface has turned to a uniform shade. There is apt to be some small area of green, spots of uneven color, or defacement of the surface. A careful search will occasionally reveal an unbroken leaf of pure unstained yellow; but the reds almost invariably retain some of the original green, or are uneven in color.

In noting the colors assumed by various species the observer should make a close distinction between ripe and dead leaves. There is both a ripening and decaying process in leaves as well as fruit. The ripening stage proceeds until a separating tissue or film forms between the petiole and the twig, and then, the supply of nourishment having been cut off, the leaf dies and falls. The yellow ones soon fade or turn brown after they drop; the red ones retain their color longer, and when properly pressed undergo little change in this respect. A ripe leaf while on the tree is still soft and flexible, whatever its color may be; a dead one is faded and sear, generally crisp and of a dull brown.

Bright colored specimens can be preserved by placing them immediately between sheets of blotting paper on which heavy weights, books, for instance, should be placed. Mr. Justus W. Folsom, in an article on "Autumnal Changes in Leaves" (Garden and Forest, Vol. VIII, p. 383), says that they are best preserved by covering them with a sheet of paper, pressing with a hot iron upon which paraffine has been rubbed, and flattening and drying between papers afterward. Leaves thus prepared will retain flexibility and color for years; but if pressed without paraffine they will soon become dull and brittle.

The colors mentioned in connection with the different species are the ones which the trees may be expected to show in autumn. But on some there will be various exceptional tints, especially the maples, among which may be found individuals bearing parti-colored leaves, some of them figured, striped or mottled like the wing of a gay butterfly. The white ash leaf in ripening passes successively from a yellow to a dark bronze, violet, and chocolate brown, while here and there a leaf will display a lilac hue during this transition.

Still, the most of our trees show only some shade of yellow, and if we had to look to them alone the autumn would lose much of its brilliant beauty. Fortunately, the reds and scarlets which add so much to the glory of our woods and landscapes in September and October, are furnished in profusion by the larger shrubs that, in the openings along the country lanes and by the water courses, display their masses of flaming color. While yellow is the predominating autumn color of the trees, red prevails in the foliage of our shrubs and bushes.

There are some seasons in which the autumnal coloring of the foliage seems especially brilliant, although it is doubtful if there is as great a difference in this respect as might be inferred from the oft-heard remarks on this particular point. Opinions as to the comparative vividness of the tints in any year may vary according to the conditions under which chance observations are made. If a person journeys through a region in which, owing to the prevalence of certain species, only the yellow shades are seen, the absence of the red and scarlet tints may readily induce the opinion that the woods are not at their best this season; and, on the other hand, if the observations are made in places where the oaks, maples and gums light up the woods with their blazing colors, the natural conclusion is that the trees look unusually fine that fall.

It must be remembered, also, that these color effects are far more brilliant and impressive when observed on a bright, sunny day and in a dry, clear atmosphere; and that the autumn foliage loses much of its attractive appearance when viewed under cloudy skies or with the air obscured by haze or dampness. One beautiful effect of the sunlight in enhancing leaf colors may be obtained by standing under a white oak, or any tree with red leaves, and looking toward the sun. With the transmitted light the leaves assume a far brighter color and a different hue than in reflected light; the dull, solid red changes into a fiery glow or rich wine color of marvelous beauty.

The direct influence of sunlight on the development of leaf color is apparent to the most casual observer. The outer leaves on a tree are the first to turn, while a leaf that is thickly shaded by others is apt to remain green until it withers and dies. Where a twig or branch presses constantly on the surface of a leaf the part thus covered remains green after the rest has turned yellow or red. If you cut your initials from tin foil or thick paper and paste them on a large leaf the letters will in time be sharply defined in green on a background of yellow or red.

Why leaves should change color is as hard to explain or understand as why the hair turns gray. The scientists who have written on the subject admit that there is much to learn about the process and its cause. The leaf cells contain rounded granules of green matter known as chlorophyll, a substance—or mixture of substances—to which the pure green color of ordinary healthy leaves is due. The appearance of any other color, such as red, yellow or purple, would indicate the presence of some substance accompanying the chlorophyll and disguising its color, or even replacing it entirely.

Most of the scientific explanations of the change of color are so technical that they are of little use to the general reader. The following extract from an article in the *Botanical Gazette* for April, 1887, entitled,

"The Autumnal Changes in Maple Leaves." by W. K. Martin and S. B. Thomas, is instructive and interesting:

"Chlorophyll, manufactured constantly under the influence of light, is constantly undergoing decomposition by the metabolism of the cell. Under ordinary conditions, the manufacture of chlorophyll is sufficient to cover up its decomposition, and the leaf retains its green color. Under certain changed conditions, however, such as intense light or diminished vitality, the decomposition of chlorophyll exceeds its manufacture, and xanthophyll (probably one of the products of decomposition) appears. In other words, xanthophyll is being formed all the time, but only becomes apparent when the manufacture of chlorophyll is checked. The condition of intense sunlight gives us the occasional summer yellowness, while to lowered vitality must be attributed the failure of chlorophyll manufacture in the autumn. This lower vitality is brought about by diminution of light, lowering of temperature, and probably causes in the plant itself. Xanthophyll then stains the chlorophyll masses yellow, which were before stained green by chlorophyll. The red coloration is brought about in a very different way, as erythrophyll is manufactured in the leaf, and stains the cell sap, leaving the chlorophyll masses untouched. This red coloring matter can not be discovered in any of the crude materials brought into the plant, or in any other part of the leaves, except sometimes in the phloem region of the petioles. When the leaf falls and the cell sap evaporates, and the chlorophyll bodies die, the erythrophyll lays hold of the cell wall and solid contents and stains them. In this way dried leaves retain their red color. As erythrophyll is soluble in water, however, contact with moisture will soon cause the most of it to disappear."

There is a popular impression that the autumnal change of leaf color is due to the action of frost; and that early frosts conduce to a more vivid tinting of the foliage. This, however, is an error that a little thought and observation will correct. Some of our trees display red and yellow leaves in August, long before cold weather comes. The brightest red shown in all our autumn foliage is that of a red maple on which the leaves turn color in August.

Conceding that the intensity of color differs with the seasons, it may be said that the most brilliant coloring of our forests occurs when a rainy summer is followed by a cool, dry August and September in which there is no frost. Undoubtedly, an early frost may precipitate a change by prematurely hastening the decay or death of the leaf; but the resultant color will be inferior, changing soon to the dull brown which characterizes sear, dead foliage. Moreover, when the fall months are cool and dry the leaves are persistent, and afford a longer display of autumnal tints.

Nor is frost necessary to the falling of the leaves. Throughout our Northern States much of the foliage of the trees falls before any frost occurs, while in the South the deciduous trees denude their branches without its aid. Frost can kill, but it can not ripen vegetation. It has been noted also by close observers that while an early frost will check the development of bright leaf colors, a hot, sunny day, about the first of October, will have the same result and loosen the leaves so that they will fall in showers when stirred by the first gentle breeze.

PRUNING SHADE TREES.

As trees grow and become older they may occasionally require pruning to remove dead limbs to improve their form and in some cases to restore them to vigor, but it seems the height of folly to prune the trees as is the prevalent custom at this time. The work of trimming shade trees in cases where it should be done should be entrusted to experienced persons only. Frequently there are parties in our cities soliciting employment as tree pruners who, by their glibness of tongue, are enabled to convince owners of their ability and obtain permission to do work for which they are the most incompetent. As a result beautiful specimens are disfigured and irremediably injured. It seems to me there is no worse injustice being perpetrated on the public than the unmerciful and unskilled trimming frequently given our shade trees in the cities.

It is true that some shade trees can be improved in appearance by an occasional trimming or cutting back in order to correct irregularities or to adapt it to a situation, and by a skilled professional pruner such work can be done without injury to the trees.

When a tree becomes stag-headed, dead at the top, or containing dead limbs, it is necessary to correct it by cutting out such defects in a proper manner. Old trees that have become bare and unsightly may often be restored to vigor and beautiful foliage by severe pruning, but any extensive trimming of this kind is only justifiable in such instances. Some trees, along walks and drive-ways for instance, can be more useful under certain conditions by increasing their height, which can be accomplished by cutting off their lower limbs, but this operation requires intelligent workmanship and should not be resorted to unless necessity requires.

The best time for pruning trees is in the fall of the year soon after the leaves have dropped, though they may be pruned in the spring with safety, but it must be done early and before there is any swelling of the buds. Soft maple and other rapid growth trees may stand moderate trimming during sap season. Whenever a branch is removed, whether a dead or a live one, it must be cut off



A VIEW OF A PRINCIPAL STREET IN INDIANAPOLIS, SHOWING THE TREES REGULARLY AND SCIENTIFICALLY TRIMMED TO CORRECT THEIR FORM, AND SHOWING THE EVIL RESULTS THEREFROM.

close to and even with the trunk, no matter how large the wound. The new wood and bark will then in time cover the denuded space. If a branch is not cut off close to the trunk, the projecting stub soon decays, its bark falls off and the stump remains, and the dead decaying wood in time forms a rotten mass extending into the heart of the tree and offering lodging for beetles and borers. Trees trimmed in the fall, as I have indicated, heal over better and do not decay.

In removing a large branch, enough of the outer portion should be cut below to prevent its weight from splitting the wood downward when the final cutting is made. All wounds made in pruning should be covered with coal tar or white lead to exclude air from the raw surface. Coal or gas tar, by penetrating parts of the wood, acts as a preservative and prevents the inroads of fungi and insects. If the pruning is done at a time when the sap exudes readily, the painting should not be done for a few days until the cut is dry, when it will adhere more readily to the wood.

It is a misery to see how many of our shade trees are defaced and mangled by unskillful trimmers. Many of our shade trees in the city, by unskilled trimming, are made full of knots, stubs, boils, cankers and deformed branches, making them examples of utter destruction as far as the purpose for which they were destined. As much to be reprehended are persons who do unskilled, unseasonable trimming as those who are polluters of society.

When an observer stops to compare the beautifully formed trees throughout the country where systematic trimming, as carried on in our city, is unknown, it ought to be evidence that constant trimming is wrong and should be abolished. I do not believe there can be found any justification for it, and I urge that persons interested in this matter use their best judgment to prevent it. The thing, it seems to me, most needed to make our trees beautiful in our cities is not trimming, but that they be planted at greater distances and allowed to form naturally, that they be given more opportunity to live by being relieved from many of the injuries sustained in general city improvements, both in extent and plan. I believe the time is propitious for property owners, who delight in having their property improved with beautiful shade trees, to study the subject very carefully and use their efforts to accordingly readjust the evils prevailing.

ARRANGEMENT OF TREES ON STREETS.

From "Tree Planting on Streets and Highways," by William F. Fox, Superintendent of State Forests, Albany, New York:

In street planting the trees should be placed with reference to the room they will need when fully grown, rather than with reference to the lot boundaries; otherwise, there will be irregularity, overcrowding and unoccupied spaces. The average city lot is too narrow to permit a tree on each, and so the proper spacing on a block must be determined irrespective of the wishes of the property owners, each of whom might want a tree in front of his house. If a block is fully planted, the trees on one side of the street should stand opposite the spaces on the other side. Planting at half distance, with the intention of removing every other tree in time, is sometimes done in order to obtain more shade at the start. But this plan is an objectionable one; the intermediate trees are seldom removed, and, in their crowded condition, become ill-shaped and undersized. The arrangement is a doubtful expedient, even if the superfluous ones are removed at the proper time; for while the trees are small they afford neither beauty nor shade, no matter how closely they were planted. The only case in which intervals might be filled with advantage is in a row of old trees that have passed maturity and are nearing their end. In such a case time can be saved by planting young ones in the spaces; for when the old decaying trees fall the young ones will be well along toward replacing them. On residential streets where the houses stand well back from the fence line, with lawns or wide yards in front, the trees should not be placed at the curb, but inside the walk where they will be free from injury, obtain more moisture, and afford an equally good shade.

An avenue should be planted throughout its entire length with the same species, or, at least, for several blocks. By using one kind on a street a stately architectural effect is obtained that will always be pleasing and impressive. While variety may be desirable for its educational tendency, it should not be permitted because of the irregular, unsightly appearance caused by trees of different sizes and shapes. Lamp posts, as well as trees, are deemed ornamental by many people; but no one would even think of erecting posts of different heights, size and appearance on the same street. The advantages of a variety are better secured by planting different species on different streets. A pleasing and advisable variation of this rule has been suggested by Mr. Lewis Collins, Secretary of the Brooklyn Tree-Planting Society—that at the intersection of wide streets an elm should be placed at each corner, an arrangement which would add rather than detract from the architectural appearance. A change of trees may be allowed on rural driveways where the irregularity of scenery will better permit such an arrangement; but, even then, it is better to avoid abrupt, repeated changes by planting the same species for a considerable distance.

Although every residential street should be well shaded, an exception may be made in commercial thoroughfares. The latter, in some instances, might be planted and thus rendered more attractive without interfering with business operations. In European cities the commercial streets often present a pleasing picture on account of the foliage which also hides from view the marks of trade, while in Holland the wharves in some places are shaded by tall trees that mingle their branches and leaves with the yard arms and rigging of vessels unloading at the docks close by.

PROTECTION OF TREES.

In towns and cities the trunk of every tree, whether young or old, newly planted or of full growth, should be enclosed to a proper height in wire netting of small mesh. Unless this is done, or some similar precaution is taken, it is not worth while to plant. The necessity for some such protection is readily apparent on examining trees from the curbstone side, and observing the large number on which the bark has been gnawed by horses. There is a feeling akin to pity when one notes the patient, repeated efforts of the tree to repair the injury—how it tries each year to cover the wound with new wood and bark, only to have it torn and widened by some fresh attack. It is wasted time to discuss punitive measures as a remedy for this evil. The horse is not to blame; and any law for the prosecution of the driver would be practically inoperative. A more sensible way would be to protect the tree by some of the simple, inexpensive devices which are available. All of the trees in Washington are protected by wire screens, of a large mesh, wrapped around the trunk. But this, in turn, will never be done until the care of the trees devolves upon the city authorities or a tree-planting society invested with necessary powers. The man in a rented house will not invest a cent to protect the tree in front of his residence, and the landlord cares nothing about it so long as he gets his rent.

The erection of electric wires for telephone service, trolley lines and illuminating purposes, is a prolific source of injury. It is a disputed question whether electricity itself does much harm; in fact, a mild current may be beneficial to trees as well as men. Professor Stone states that, as shown by experiments, the alternating current is less disastrous to plant life than the direct current, and that either, when used at a certain strength, will accelerate growth and strength. The injury from the current is mostly local, being confined to points of contact; and this can be largely prevented by a complete insulation of the wires. But the mutilation or destruction of trees caused in the stringing of the wires is another matter. This evil can be prevented by the village or town authorities, unless a right of way has been granted which gives the railroad, telephone, or electric light company permission to remove any obstruction that interferes with the erection of its poles and wires.

Protection from insects requires constant care and watchfulness. As the householder, generally, has only a few trees to look after, he can, with proper care and diligence, effectually check any insect pest before serious damage is inflicted. But neglect and carelessness on his part may result in the loss of his trees. At the first sign of danger expert ad-

vice should be sought for as to the proper remedies and methods to be employed. Where a large number of trees on a street or lawn are attacked by insects a spraying with poisonous mixtures must be resorted to.

Spraying is done with a duplex pump operated by a steam or gasoline engine, the machinery and tank being placed in a light spring wagon and hauled with one horse from place to place. With ninety-five pounds pressure, or thereabouts, trees eighty feet high can be sprayed; and by using ladders, and hose with a spray nozzle, the under side of the leaves can be thoroughly drenched. This apparatus is used on streets and in public parks, or wherever a large number of trees require treatment. The citizen who is mostly concerned with the trees of his own street front or lawn can obtain satisfactory results from a hand pump with plenty of hose. To be effective the spraying must be done at the time the insects begin to feed.

Various mixtures have been tried—Paris green, London purple and arsenate of lead—each with good effect. Professor Felt, State Entomologist, recommends the following preparation as an effective one against the ravages of leaf-devouring species: Dissolve eleven ounces of acetate of lead (sugar of lead) in four quarts of water in a wooden pail, and four ounces of arsenate of soda (50 per cent. purity) in two quarts of water in another wooden pail. As the acetate of lead dissolves rather slowly in cold water, the process can be hastened by using warm water. Pour the resulting solution into the spraying tank, which should contain about eighty gallons of water. Where a contact insecticide becomes necessary, as in the case with sucking or biting insects, aphids, plant lice, scale pests, etc., he advises the use of this emulsion: Dissolve one-half pound of hard soap in one gallon of boiling water, and, while still hot, add two gallons of kerosene; emulsify by passing rapidly through a force pump till it assumes a uniform creamy consistency and the oil does not separate. Dilute this with ten parts of water before using. In limestone regions use the sour milk emulsion, composed of one gallon of sour milk and two gallons of kerosene; emulsify and dilute as described before.

The cost of spraying depends necessarily on the extent of the work—the larger the number of trees the less will be the average expense. In 1898 the cost of spraying elms in Albany was about fifteen cents per tree for each application; and in 1900, with a more expensive apparatus and men working under the eight-hour law, it cost twenty-two cents. In Troy, trees were sprayed by contract at twenty-three cents for each spraying, a much higher price being charged for single or scattering trees. In New Brunswick, N. J., a contract for the season, including treatment as often as needed, was made at one dollar per tree. The expense, whatever it may be, is insignificant as compared with the value of the trees.

A simple and effective check on certain insects—the white-marked tussock moth, for instance—consists in destroying the egg masses. In 1894 the school children of Rochester, N. Y., stimulated by liberal cash prizes, gathered 8,800,200 cocoons of this insect, and thoroughly eradicated the pest in that locality. Of the successful scholars, sixty-five received a \$10 gold piece each, while others received smaller awards. The prizes, which were offered and paid by the Genesee Valley Forestry Association, amounted to much more than was expected, but the money was well

expended and cheerfully paid, as the city saved its shade trees and secured immunity from further ravages of a destructive insect.

The limits of this article will hardly permit of a description of the various insects and borers that infest our shade trees; or a recital of the many formulas for insecticides which have proved effective in checking their ravages.

The insects which kill or injure shade trees may be divided into three general classes: (1) the leaf-devouring or masticating species; (2) the leaf-piercing, non-masticating, or sucking insects; (3) the borers. Professor Felt, in the previous reports of the Forest Commission, gives a minute description of the tussock moth, forest tent caterpillar, leopard moth, maple borer, maple tree pruner, cottony scale insect, elm leaf beetle, bag worm, fall web worm, spiny elm caterpillar, elm borer, elm bark louse, and elm snout beetle. These descriptions are accompanied by colored illustrations showing the insects at each stage of transformation; also, formulas for insecticides, spraying mixtures, and emulsions, together with the details of other methods that have proved effective.

MUNICIPAL CONTROL.

In towns where there are no well-organized tree-planting or village improvement societies the planting of street trees and their subsequent care should devolve on the city or village government, preferably, if in a city, on the park commissioners, as the officials in that department would be better qualified for the work, farther removed from political influences, and would be more apt to have the long tenure of office necessary to the proper management of the work. The planting and care of street trees belongs to the city government as much as street paving. Under the stimulus of local improvement societies individuals often do some planting; but when they sell their property or move away the trees are apt to be neglected. Moreover, it is difficult without municipal control to secure the concerted action necessary for planting a street its entire length with uniform and properly selected species.

Then, again, under the management of a special city department, properly supplied with funds, the spraying of trees and suppression of insect pests can be successfully accomplished; but it is doubtful if our trees can be preserved from this evil through the partial and disconnected efforts of individuals. As in Washington and Paris, every city should establish nurseries, supported by municipal appropriations, in which the various species best adapted to street planting can be propagated and grown with special reference to such use.

In some of our cities—New York and Brooklyn, for instance—valuable and effective work has been accomplished by tree-planting societies; and their intelligent efforts should receive, in some form or another, substantial recognition from the city government. While there may be legal objections to conferring municipal powers on individuals or associations, liberal appropriations might, with good precedent, be made for the benefit of a tree-planting society to enable it to carry on its work. Actuated by disinterested enthusiasm, and provided with funds for the employment

of competent men, the society would do as good and intelligent work as any park commission, and, under certain circumstances, secure better results.

People who question the advisability of planting shade trees in cities rehearse the old story about the injurious effects of smoke, dust and pavements, and then point to some sickly, deformed specimens in proof of their argument. But these unfortunate trees are the result of poor selection, bad planting, and neglect; and the blame should not be laid elsewhere. Asphalt pavement, though impervious to rain, will not prevent trees from obtaining moisture. On the other hand, it prevents evaporation; the earth beneath it is always damp, for there is still a supply of water from adjoining areas and small underground courses. For years the street trees of Washington and Paris have grown and flourished on the asphalt pavement of those cities.

It must be conceded, however, that asphalt or other impervious pavements lessen greatly the supply of moisture and prevent a sufficient aeration of the roots. To obviate this unfavorable condition as far as possible the flagging on the sidewalks should be cut out around the tree—leaving a circular space as large as the situation will permit—to facilitate artificial watering, to enable more of the rainfall to reach the roots, and to allow a frequent loosening of the earth at the surface. On narrow sidewalks this opening in the flagging should be in the form of an oblong rectangle in which the longest sides are parallel with the curbstone, as a larger space can thus be obtained without encroaching on the pathway. A still better plan would be to lay the flagging to the tree line only, leaving a strip of ground next the curbing, covered with gravel. The intervals between the trees are not used by people walking along the street. A slight slope in the surrounding flagstones—not enough to interfere with walking—will increase the area of drainage and amount of moisture received, and a portion of the water that falls on the house roofs can also be conducted in proper quantity from the eaves-troughs and leaders to the roots by conduits laid beneath the flagstones. Where there is an asphalt pavement, openings protected by iron gratings should be left in the gutter opposite each tree, through which water will find its way at every shower, or when the gutters are flushed from a hydrant.

Another unfavorable condition caused by a tight pavement is the prevention of a proper aeration of the roots. This can be remedied to some small extent by the openings left in the flagging at the base of the trunk. But this affords only a partial remedy at the best, and so we can not expect that a city tree on a closely paved street and sidewalk will develop the same thrifty growth and appearance as if it stood on a village street where the ground around it was exposed to air and sunlight.

People who believe in the efficacy of fertilizers in promoting tree growth are apt to consider the planting of paved streets a doubtful undertaking because there is no opportunity to enrich or cultivate the ground. But such discouragement does not seem to be based on sufficient reasons. Fertilizing material is beneficial to surface crops, but it can exert but little influence on roots that penetrate deeply in the earth, and which must draw their sustenance from the lower strata found there, good or bad as the case may be.

In many city streets the ground presents unnatural and unfavorable conditions. The surface has been cut down extensively by grading or blasting, which leaves exposed only the sterile earth of the lower strata; or a depression has been filled, in which case the planting must be done on "made ground" composed of ashes, street litter, old tinware, and all the other kinds of rubbish which are dumped in such places by the street cleaning bureau. Such conditions, however, should not be considered as a deterrent in planting; but they demand a more thoughtful study of the situation, with some additional effort in providing larger holes and an ample supply of fertile soil.

While smoke and dust undoubtedly are injurious to some species, leakage from gas mains has caused by far the greatest destruction of trees in city and village streets. No matter how hardy the species, how well it is planted, or how carefully it is fostered, if the ground becomes saturated with illuminating gas the tree is doomed. It may be assumed that a gas company will, in its own interest, endeavor to prevent any leakage in its mains. But the work of finding and stopping a small leak may cost more than the loss of the gas; and it is the small leak, when near a tree, that does the mischief.

A frequent source of injury is the unnecessary mutilation of the larger roots by laborers employed in digging the ditches for gas or water mains. In most cases this can be avoided by the exercise of some care and a slight expenditure of time, which should be insisted upon by the city authorities.

Let every citizen who finds enjoyment in well-shaded streets make an effort to procure the passage of a city ordinance placing the entire control of the trees of his town in the hands of a tree-planting society, or the park department, or some special commission, and use his influence, also, to see that ample funds are annually appropriated by the municipal or village government to carry on the work.

THE AUDUBON SOCIETY.

As time passes it is seen that our native birds are becoming less in numbers. The familiar birds which once gathered about our homes are rapidly disappearing, and seldom are we cheered by their songs and entertained by their movements. With them have gone many added interests in life, which can only be enjoyed by fostering the birds.

For the purpose of protecting and fostering our native birds, the Audubon Society has been instituted. It is named in honor of John James Audubon, the first noted student of the birds of America. Indiana has a State society, besides many local societies, in which both young and old are taking part. It is gratifying to note that many schools are perfecting organizations and clubs for the protection and preservation of birds.

These organizations can do a vast amount of good in the way of preventing and discouraging the destruction of and cruelty to birds. No better line of nature work could be instituted than the study of birds as to their coming and going, plumage, mating, nesting, feeding habits, songs, colors, manner of flying and walking, bathing and the regularity of all habits.

It is desired that the teachers and pupils shall lend their united action to this most commendable undertaking.

The following is an article written by Prof. Lawrence Brnner, of the University of Nebraska, entitled, "A Plea for the Protection of our Birds:"

The fact that insect depredations are increasing in extent each succeeding year makes it plain to us that something must be done to prevent it, and that quickly. We have found to our sorrow, that although we are continually making increased efforts to destroy these pests, our efforts avail but little, and the destruction of our crops goes on. What, then, is to be done? How can we be released from this ever increasing struggle for existence?

The answer is plain. Heed the advice of the naturalist who has made a study of the life-histories of the various other living creatures in the world about us. Do not condemn what he says without at least examining into it a little.

In his desire for bird protection the naturalist is not prompted by sentiment alone—far from it! Although from the sentimental standpoint solely the friend of birds would have sufficient grounds for making such a request.

But if we can not take up the subject of bird protection from the humane standpoint, if we have no chord of sympathy or sense of honor remaining, are we willing to adopt business principles in our dealings with the birds?

It is needless here for me to state that the insect life about us is numerous and varied. We all know this to be too true. Nearly, if not quite, nine-tenths of all animal forms belong here, while the individuals of many kinds are incalculable. We know also that their powers of reproduction are simply wonderful, being limited only by the amount of food available, etc. Now the disproportionate number of birds, on the other hand, with their "universal distribution, the remarkable locomotive power which enables them readily to escape unfavorable conditions, and their higher rate of life, requiring for their maintenance an amount of food relatively enormous," give to them a significance which few seem ever to have realized.

Briefly told, the economic relation of birds to man lies in the services which they render in checking the undue increase of insects, the devouring of small rodents, in destroying the seeds of noxious weeds, and by acting as scavengers on land and water.

Those who have studied the subject carefully have estimated that a loss of nearly \$400,000,000 is sustained annually by the cultivators of the soil from insect ravages in the United States and Canada. This does not include the damage done to ornamental shrubbery, shade, and forest trees, nor to the grasses growing on our prairies. "But if insects are the natural enemies of vegetation, birds are the natural enemies of insects."

"In the air swallows and swifts are coursing rapidly to and fro, ever in pursuit of the insects which constitute their sole food. When they retire, the night-hawks and whip-poor-wills will take up the chase, catching moths and other nocturnal insects which would escape day-flying birds. Fly-catchers lie in wait, darting from ambush at passing prey, and with a suggestive click of the bill returning to their post. The warblers, light, active creatures, flutter about the terminal foliage, and with almost the skill of a humming-bird, pick insects from the leaf or blossom. The vireos patiently explore the under sides of leaves and odd nooks and corners to see that no skulker escapes. The woodpeckers, nuthatches, and creepers attend to the trunks and limbs, examining carefully each inch of bark for insects' eggs and larvae, or excavating for the ants and borers they hear within. On the ground the hunt is continued by the thrushes, sparrows, and other birds that feed upon the innumerable forms of terrestrial insects. Few places in which insects exist are neglected; even some species which pass their earlier stages or entire lives in the water are preyed upon by aquatic birds."

In nearly every case where the food habits of our birds have been carefully studied, do we find that the good done far exceeds the possible harm that might be inflicted by our birds. Allowing twenty-five insects per day as an average diet for each individual bird, and estimating that we have about one and one-half birds to the acre, or in round numbers

75,000,000 birds in Nebraska, there would be required 1,875,000,000 insects for each day's rations.

Again, estimating the number of insects required to fill a bushel at 120,000, it would take 15,625 bushels of insects to feed our birds for a single day, or 937,500 bushels for 60 days, or 2,343,750 bushels for 150 days. These estimates are very low when we take into consideration the numbers of insects that various of our birds have been known to destroy in a single day. For example, the stomachs of four chickadees contained 1,028 eggs of cankerworms. Four others contained about 600 eggs and 105 mature females of the same insect. The stomach of a single quail contained 101 potato beetles; and that of another upwards of 500 chinch bugs. A yellow-billed cuckoo shot at 6 o'clock in the morning contained forty-three tent caterpillars. A robin had eaten 175 larvae of *Bibio*, which feed on the roots of grasses, etc., etc.

Birds, like all other animals, feed upon that food which is most readily obtained, hence the insectivorous kinds destroy those insects which are most numerous—the injurious species.

Estimating that there is a single grasshopper, katydid, or cricket to each square yard of surface, it would require at least 650,000 bushels of these insects to cover the State. Not taking into account any of the myriads of other insect forms nor the rapid rate of reproduction which is going on among them, these alone would be nearly one-third enough insect food for our birds during the year. This being true, it is plain that at least twice as many birds could find the proper insect food in our State each year.

A perusal of the various works that have been written on the economic relations of birds to man will support the statement that, if we were deprived of the services of birds, the earth would soon become uninhabitable.

In addition to the actual good that birds do as recorded above in the destruction of noxious insects, many of them are engaged for at least one-half of the year in hunting out and devouring the seeds of various weeds and other, to us, useless plants. Such is the mission of the various sparrows, snowbirds, finches, and long-spurs which often occupy our fields in flocks of thousands during the winter months.

If, after ascertaining such truths as the above regarding birds, we continue to slaughter them, it is not due to thoughtlessness on our part. We do it wilfully and maliciously. The schoolboy may thoughtlessly rob a bird's nest or kill a bird or two. It is the duty of teacher and parent alike to teach him better, to show him how wrong it is to destroy life uselessly. It is especially their duty to prevent the destruction of birds. If each schoolboy in the State of Nebraska were to rob a nest of say five bird's eggs, what would be the result? Yet the making of bird-egg collections is getting to be such a "fad" that almost every boy enters into it more or less zealously at some time or other. Some single collectors in a single season take 500 or more eggs. This should be stopped. We can study birds and their nests without destroying either. A live bird is more interesting than a dead one. An egg left in a nest where it will in due time become a live creature is of more interest than an empty egg shell.

We, as citizens of the United States, pride ourselves on being highly civilized and humane. We are in some directions, in others not. We also claim to be intensely practical and business-like in everything. Are we?

In Indiana alone nearly three hundred and fifty different species of birds are found. Many of these species represent large numbers while some have become almost extinct. From morning till night these birds are working for us during their entire life. Constantly they are searching for and devouring the creatures that destroy fruit, vegetables and foliage, and feeding on seeds of noxious weeds. It is a lamentable fact that many persons are not aware that the birds are toiling for them, and kill them in the belief that they are thieves and intruders of the most dangerous character.

Instances are rare in which birds do harm, except in the case of the English sparrow. Birds that seem to be pecking at and injuring fruit are only seeking for worms, and the harm attributed to them is simply imaginary and not founded on fact.

JOHN JAMES AUDUBON.

John James Audubon, the naturalist, was born on a plantation near the city of New Orleans, La., May 4, 1780. His father was an officer in the French navy and owned a plantation in the then French colony. In early childhood he manifested a deep interest in birds and studied closely their habits. He received the best education that he could be given in America and then completed at Paris, France, where he was sent in 1794.

At Paris he studied design under the great artist, David, who was an eminent painter. In 1789, at the age of seventeen, he returned to the United States and began a career of farm life on a farm given him by his father, in eastern Pennsylvania, but he kept up his favorite study of birds. He was married in 1808 to Miss Lucy Bakewell and sold his farm and engaged in business at Louisville, Ky. About two years later he resumed active study of birds and spent his time making extensive excursions through dense forests of the Southern and Southwestern States. He made colored drawings of all species of birds which he found. He removed with his family to Hendersonville on the Ohio River and remained there several years pursuing a study of the birds of the region, frequently coming across the river into Indiana.

Mr. Audubon became in very poor circumstances. He had lost all his property and many times, the history of his life tells us, he was without a dollar to purchase the necessities for his family. He became a teacher and taught music, French, drawing, painting, dancing and fencing. In 1824, while on a visit to Philadelphia, he met Charles Lucien Bonaparte, who persuaded him to publish a work on ornithology. He went to London and began the work of publication in 1826. The work was not completed for more than ten years.

This excellent publication consisted of ten volumes, illustrated with 448 fine colored plates of 1,065 species of birds of natural size. The work was divided into two divisions of five volumes each of letter press and engravings. It is pronounced the most magnifi-

cent work ever published on ornithology. One hundred and forty-four persons subscribed for the work and it was the means of placing Audubon and his family in good circumstances. It is said that there are eighty copies of the book in America, each of which would bring on the market now from \$1,500 to \$2,000. He was the first man to devote his life to the study of the birds of America and his works are known all over the world.

He visited back and forth several times between the United States and Europe in the interest of others of his publications, for he did not rest on the laurels of his first success, but he finally settled permanently on the Hudson River at Audubon Park, now a part of New York City, and died there January 27, 1851.

SOME CHARACTERISTICS OF A FEW COMMON BIRDS.

NOTE.—The following descriptions are not intended to be complete nor are they supposed to be the most interesting things which may be said. It is intended only to note a few prominent characteristics to which many more may be added. It will be found both interesting and helpful to give some attention to the birds mentioned under each description.

The general impression is that each year brings more birds. This may be true. Still it may only seem to be true because they are receiving more attention. It is enough to know that a keener interest is taken in birds, not only from an economical point of view, but from the esthetic as well. The latter phase appeals much more strongly to children than the former, and they will learn to protect the bird not simply because they are useful, but also because they are loved.

THE SONGS OF BIRDS.

The birds of morning rise and shake
The music from their souls again;
I hear them in the tangled brake;
They warble down the shadowy glen;
And still to me
They seem to be
Forever fluting out the call,
“Come up! Come up!
The royal feast
Is spread for man and bird and beast,
With peace on earth, good will to all.”

—Benjamin S. Parker.

THE RED-HEADED WOODPECKER.

The red-headed woodpecker is from eight and one-half to nine and three-fourths inches in length—a little smaller than the robin. The head, neck and throat are crimson; the breast and underneath portions, white; the back, black and white; the wings and tail, blue-black with a broad white band on wings, conspicuous in flight.

The red-head is a very noisy, active bird, with ability to resist the most extreme cold of the Northern States in winter, if food is abundant. It selects a partly decayed tree in which to excavate a hole for its nest, because the digging is easier and the sawdust and chips make a softer lining than green wood. The heap of sawdust at the bottom of the hollow will eventually cradle from four to six glossy eggs.

In connection with the red-head, study other woodpeckers—the flicker or yellow-hammer, the sap-sucker, the zebra-bird or wood-chuck.

THE QUAIL.

BOB-WHITE.

The quail is about ten inches in length. Its upper parts are reddish-brown or chestnut, flecked with black, white and tawny. The throat is white. The under portions are much lighter than the back. The female has a buff throat patch instead of white. In summer the crown is blacker, and the fluffy markings lighter than in winter.

The habits of this bird are so well known that it is hardly necessary to mention them here. However, it is due the male to note a few of his virtues. He takes turns with the female in covering the eggs; he ministers to every want of the family should an accident befall the mother, and in the South, when the female frequently begins to lay again when her first brood is but a few weeks old, it is the father, a pattern of all domestic virtues, that then assumes its full care. What more is necessary to insure complete family happiness!

Study here prairie chicken, turkeys, and the grouse.

THE BALTIMORE ORIOLE.

The Baltimore oriole is from seven to eight inches in length, or about one-fifth smaller than the robin. The head, throat and upper part of the back of the male is a glossy black; his wings are black with white spots and edgings; the tail quills are black with yellow markings on the tips. Everywhere else is orange shading into flame. The female has more subdued colorings.

“A flash of fire through the air, a rich, high whistled song floating in the wake of the feathered meteor, the Baltimore oriole can not be mistaken.”

With this notice the meadow lark, the bobolink, cow-bird, red-winged blackbird, and orchard oriole.

THE ORIOLE.

Hush! 'tis he!

My oriole, my glance of summer fire,
Is come at last; and, ever on the watch,
Twitches the pact thread I had lightly wound
About the bough to help his housekeeping—
Twitches and scouts by turns, blessing his luck,
Yet fearing me who laid it in his way.
Nor, more than wiser we in our affairs,
Divine the providence that hides and helps.
"Heave, ho! Heave, ho!" he whistles as the twine
Slackens its hold. "Once more, now!" and a flash
Lightens across the sunlight to the elm
Where his mate dangles at her cup of felt.

—James Russell Lowell.

THE WOOD THRUSH.

(SONG THRUSH OR WOOD ROBIN.)

The wood thrush is about eight inches in length, somewhat smaller than the robin. It is brown above, reddish on head and shoulders, and shading into olive-brown on the tail. The throat, breast and underneath, white; plain in the middle, but heavily marked on sides and breast with heart-shaped spots of very dark brown.

This bird is not at all confined to the woods, as its name would indicate, but is often seen on shaded lawns and in shrubbery. Its power of song is very great, comparing well with that of any of the thrushes. "Too many guardians of nests have a dangerous habit of singing near them. Not so the wood thrush. His flute-like song, 'Come to me,' invites the intruder far away from where the blue eggs lie."

THE WOOD THRUSH.

From out of the forest depths,
 Clear, sweet, and strong,
 Floats on the evening wind,
 Shy bird, thy flute-like song.

What is it thou wouldst tell?
 No secret woe nor wrong
 Tinges, with its sad chords, the silvery swell
 And liquid rush of thy melodious song.

Nor is it rapturous joy,
 A meaningless delirium of sound;
 The riotous license of a spirit fair,
 Knowing no check nor bound.

In my lone forest walk,
 Hidden away from sight and sound of men,
 I've heard the tinkling of a waterfall
 That leaped and sang, then lost itself again.

To the same key your voices wild attune,
 Pure, unimpassioned, free;
 No faint refrain of sorrow, hope, desire;
 Simply the dryad's joy—to be.

No human heart is yours;
 The passions wild that o'er it steal—
 Eternal longings, sorrow, and remorse—
 Ye neither know nor feel.

Nor are its joys your joys,
 Infinite answerings to the soul's desires;
 Yet not unequal are ye, after all—
 Each has the fullness that its need requires.

Sing on, shy bird and tinkling waterfall!
 From bounteous Nature's heart
 Hymnals of praise perpetually arise
 And in them you have part.

—Hannah Davis.

THE HOUSE WREN.

The house wren is from four and one-half to five inches in length, apparently much smaller than the English sparrow. The upper parts are cinnamon-brown; the back has obscure, dusky bars: the wings and tail are finely barred; underneath is whitish, with grayish-brown bands on the side. As its name indicates, it likes to live near human habitation, returning to the same place year after year, and building its nest in the same spot.

Its exquisite song is described as follows: "Like some little mountain spring that, having been imprisoned by winter ice, now bubbles up in the spring sunshine and goes rippling over the pebbles, tumbling over itself in merry cascades, so this little wren's song bubbles, ripples, cascades in a miniature torrent of ecstasy.

In connection with the wood thrush and the house wren, study the following birds: Carolina wren, winter wren, brown thrasher, cat-bird and mocking-bird.

THE LITTLE BROWN WREN.

The little brown wren has the brightest of eyes,
And a foot of a very diminutive size;
Her tail is as trig as the sail of a ship;
She's demure, though she walks with a hop and a skip:
And her voice—but a flute were more fit than a pen
To tell of the voice of the little brown wren.

—Clinton Holland.

SUGGESTIVE POEMS.

INDIANA POETS.

The Red-Bird—Evaldeen Stein.
The Sugar Maple—B. S. Parker.
An Autumn Sunset—B. S. Parker.
The Empty Nest—B. S. Parker.
My Robin—B. S. Parker.
The Song of the Birds—B. S. Parker.
The Song of the Imprisoned Thrush—B. S. Parker.
The Wabash—Maurice Thompson.
White River—Josie V. N. Koons.
Stubble—Mary Hannah Krout.
The Red-Bird in Winter—Jethro C. Culmer.
In September—Jethro C. Culmer.
My Robin—Sarah K. Bolton.

LONGFELLOW.

Woods in Winter.
Autumn.
Sunrise on the Hills.
The Emperor's Bird's Nest.

BRYANT.

Among the Trees.
Autumn Woods.
A Winter Piece.
The Planting of the Apple Tree.

MISCELLANEOUS.

Plant Trees—Whittier.
The Heart of the Tree—Henry C. Bunner.
Our Little Martyrs—Geo. Klinge.
Bird Trades—Lincoln Literary Collection.
Birds' Nests—Lincoln Literary Collection.
Read Story of the White Heron (prose)—Sarah Orme Jewett.

OUTLINE PROGRAM.

1. Devotional Exercises.
Song. Scripture Reading and Prayer. Song.
2. Reading Proclamation and Other Formal Documents.
3. Songs. Arbor and Bird Day.
4. Literary—
Essays:
 - a. Arbor Day and Purposes.
 - b. Bird Day and Purposes.
 - c. Compositions by Children on Birds Mentioned in This Pamphlet.
 - d. Benefits of Trees and Birds.
 - e. How and When to Plant and Care for Trees.
 - f. The Best Trees and Shrubs to Plant.Recitations:
 - a. Poems About Trees, Birds, Flowers and Patriotism.
 - b. Gems About Trees, Birds, Flowers and Patriotism.Songs:
 - a. About Trees, Birds, Flowers and Patriotism.
5. Brief Reports of Observations by Pupils—
 - a. Of Finely Ornamented Home Lawns.
 - b. Of Finely Ornamented School Grounds.
 - c. Of Finely Shaded Highways and Drives.
 - d. Of Fine Specimen Trees Along Highways, on Lawns and in the Forest.
 - e. Of Species of Trees in Home Forests.
 - f. Of Dense Forest Tracts in the Vicinity.
6. Short Address—
Our Duty in Planting Trees and Protecting Birds.
7. Organization of Pupils' Clubs for Planting Trees and Protecting Birds.
8. Planting and Dedication of Trees.